

06-NOV-09  
10:21:04

GEORGIA DEPARTMENT OF TRANSPORTATION  
PRECONSTRUCTION DIVISION - OFFICE OF BRIDGE & STRUCTURAL DESIGN  
THE ANALYSIS AND DESIGN OF PIERS FOR BRIDGES - V 4.2.07 - AASHTO SPECS 1984 INTERIM  
REVISED: JUNE 30, 2008  
32' CURB-CURB; 4 BEAMS; 180' SPAN; 110' TALL; BRIDGE 2B ; PIER 7

PROB. NO. 0001

DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C S	FC PSI	N	FY PSI	FS PSI	DESIGN DATA EC KSI	ES KSI	CONC. STRAIN	Z FACT	* MAIN SIZE	* STR SIZ	* CAP MAX TOP	REINFORCING MAX BOT	STEEL MIN SIZE	* MIN NO.	* TOP CL.	* MIN S.SP	* CAP DEPTH	* BOT CL.
D D D L	2	1	6	0-00-00		3500.	1400.	8.	60000.	24000.	3409.	29000.	0.0030	170.	11	5	16	16	11	2	2.00	4.00	3.00	2.00
COLUMN MIN.	1.00	8.00	2.50	3.750	2	2.00	0.70	0.90	1.00	1.00	0.75	16.39	0.120	0.000	3.00	9.00	1.250	1.000	3.000	235.000				-9.999

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	17.625	4.000	4.000	6.000	6.000	4.000	13.625	14.000	9.333	0.667					
12	2	SAME AS CANTILEVER 1														

COLUMN DATA

CN	P	I	T	S	HT	A	DT	BT	DB	BB	DL	FLEX	ND NB	SZ ND	NB SZ	ND NB	SZ ND	NB SZ	SLOPE	EP	AP						
21	0	V	T		110.000	6.000	8.000	6.000	11.400	9.400	6.000	0.000	8	6	11	11	9	11	22	16	11	32	26	11	0.000	0.000	0.000

FOOTING DATA

CN	S/P	B	D	T	DEL.B	DEL.D	DEL.T	R.B/D	R.D/B	S.HT.	NP	SYM.	BP	DP	SET.
31	P	13.400	13.400	3.000	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000
GROUP II WIND INTENSITIES * WIND FORCE ARM * WIND ON PIER															
SUPERSTRUCTURE AREA*STD. TRANS. LONG. WIND FT1 FL1 WIND ON SUPERSTRUCTURE INTENSITIES FT2 FL2 FT3 FL3 FT4 FL4 FT5 FL5 WIND ON LIVE LOAD INTENSITIES FT1 FL1 FT2 FL2 FT3 FL3 FT4 FL4 FT5 FL5 LENGTHS OF LL * WIND ON LL ARMS TRANS. LONGI. APT APL															
1898. 1898. 1 50 0 44 6 41 12 33 16 17 19 7.771 7.771 15.883 26.915															

STD. WIND	* FT1	WIND ON SUPERSTRUCTURE	INTENSITIES	* FT1	STD. WIND	* FT1	WIND ON LIVE LOAD	INTENSITIES	* FT1	LENGTHS OF LL	* TRANS.	LONGI.	* WIND ON LL ARMS	APT	APL										
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	180.0	180.0	16.375	16.375

CENTRI. FT	TRACTION FL	FORCE APT	MISCELLANEOUS FORCES AND ARMS APL	EXPANSION COEFFICIENT	SHRINKAGE COEFFICIENT	STREAM PT	FLOW PL
14.624	6.660	16.375	16.375	0.00018000	0.00044000	0.000	0.000

DEAD LOAD SUPERSTRUCTURE AND LIVE LOAD CASES

I.D.	NL	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
D.L.	0	370.920	350.950	0.000	0.000	414.130	339.360						
LL01	1	29.400	62.970	0.000	0.000	97.010	113.550						
LL02	1	132.450	70.560	0.000	0.000	68.530	26.040						
LL03	2	46.940	108.870	0.000	0.000	158.390	139.590						
LL04	2	43.910	112.270	0.000	0.000	165.550	115.570						
LL05	2	139.310	133.530	0.000	0.000	110.980	34.730						
LL06	2	161.850	116.530	0.000	0.000	102.110	33.150						

COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

LOAD	COL	TRANSVERSE							LONGITUDINAL					
		PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF		
UNIT F.AT CL.CAP	1	0.000	-6.000	1.000	110.000	0.000	0.000	0.000	6.000	1.000	110.000	110.000		
DEAD LOAD TOTAL	1	1680.110 2860.302	-146.980	0.000	146.980	2860.302	7628.202	-7481.222	0.000	0.000	0.000	0.000		
TRAC. FORCE 1 LN	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-149.018	-6.660	-841.657	-841.657		
CENT. FORCE 1 LN	1	0.000	-327.212	14.624	1848.108	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
WIND ON SUBSTR.	1	0.000	-95.298	15.883	1747.130	0.000	0.000	0.000	-161.490	-26.915	-2960.650	-2960.650		
GROUP 2 WIND 1 1	1	0.000	-1402.166	110.783	12923.598	0.000	0.000	0.000	-161.490	-26.915	-2960.650	-2960.650		
GROUP 2 WIND 1 2	1	0.000	-1402.166	110.783	12923.598	0.000	0.000	0.000	161.490	26.915	2960.650	2960.650		
GROUP 2 WIND 2 1	1	0.000	-1245.342	99.395	11582.422	0.000	0.000	0.000	-318.314	-38.303	-4301.826	-4301.826		
GROUP 2 WIND 2 2	1	0.000	-1245.342	99.395	11582.422	0.000	0.000	0.000	318.314	38.303	4301.826	4301.826		
GROUP 2 WIND 3 1	1	0.000	-1166.930	93.701	10911.834	0.000	0.000	0.000	-475.138	-49.691	-5643.002	-5643.002		
GROUP 2 WIND 3 2	1	0.000	-1166.930	93.701	10911.834	0.000	0.000	0.000	475.138	49.691	5643.002	5643.002		
GROUP 2 WIND 4 1	1	0.000	-957.831	78.517	9123.599	0.000	0.000	0.000	-579.688	-57.283	-6537.120	-6537.120		
GROUP 2 WIND 4 2	1	0.000	-957.831	78.517	9123.599	0.000	0.000	0.000	579.688	57.283	6537.120	6537.120		
GROUP 2 WIND 5 1	1	0.000	-539.633	48.149	5547.129	0.000	0.000	0.000	-658.100	-62.977	-7207.708	-7207.708		

PIER-32-4-180-110.OUT													
GROUP 2 WIND 5 2 1	0.000	-539.633	48.149	5547.129	0.000	0.000	0.000	0.000	0.000	658.100	62.977	7207.708	7207.708
GROUP 3 WIND 1 1 1	0.000	-823.400	51.235	6151.830	0.000	0.000	0.000	0.000	0.000	-48.447	-8.075	-888.195	-888.195
GROUP 3 WIND 1 2 1	0.000	-823.400	51.235	6151.830	0.000	0.000	0.000	0.000	0.000	48.447	8.075	888.195	888.195
GROUP 3 WIND 2 1 1	0.000	-728.023	45.659	5476.507	0.000	0.000	0.000	0.000	0.000	-143.824	-13.651	-1563.518	-1563.518
GROUP 3 WIND 2 2 1	0.000	-728.023	45.659	5476.507	0.000	0.000	0.000	0.000	0.000	143.824	13.651	1563.518	1563.518
GROUP 3 WIND 3 1 1	0.000	-680.334	42.870	5138.845	0.000	0.000	0.000	0.000	0.000	-239.201	-19.227	-2238.841	-2238.841
GROUP 3 WIND 3 2 1	0.000	-680.334	42.870	5138.845	0.000	0.000	0.000	0.000	0.000	239.201	19.227	2238.841	2238.841
GROUP 3 WIND 4 1 1	0.000	-553.164	35.435	4238.415	0.000	0.000	0.000	0.000	0.000	-302.786	-22.945	-2689.056	-2689.056
GROUP 3 WIND 4 2 1	0.000	-553.164	35.435	4238.415	0.000	0.000	0.000	0.000	0.000	302.786	22.945	2689.056	2689.056
GROUP 3 WIND 5 1 1	0.000	-298.825	20.565	2437.554	0.000	0.000	0.000	0.000	0.000	-350.475	-25.733	-3026.718	-3026.718
GROUP 3 WIND 5 2 1	0.000	-298.825	20.565	2437.554	0.000	0.000	0.000	0.000	0.000	350.475	25.733	3026.718	3026.718
LIVE LOAD LL01	1	302.930	1336.965	0.000	-1336.965	302.930	705.481	-2042.446	0.000	0.000	0.000	0.000	0.000

□ COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

LOAD	COL	TRANSVERSE							LONGITUDINAL			
		PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF
LIVE LOAD LL02	1	297.580	-1499.214	0.000	1499.214	297.580	2183.604	-684.390	0.000	0.000	0.000	0.000
LIVE LOAD LL03	1	453.790	1528.210	0.000	-1528.210	453.790	1165.256	-2693.466	0.000	0.000	0.000	0.000
LIVE LOAD LL04	1	437.300	1251.898	0.000	-1251.898	437.300	1138.704	-2390.602	0.000	0.000	0.000	0.000
LIVE LOAD LL05	1	418.550	-1569.361	0.000	1569.361	418.550	2573.524	-1004.164	0.000	0.000	0.000	0.000
LIVE LOAD LL06	1	413.640	-1869.098	0.000	1869.098	413.640	2809.746	-940.647	0.000	0.000	0.000	0.000

□ CAP ANALYSIS AND DESIGN DATA

POINT	D.L.TOT.	MOMENTS(KIP-FEET)						SHEARS(KIPS)					
		G1 MAX.+	G1 MAX.-	G2 MAX.+	G2 MAX.-	G3 MAX.+	G3 MAX.-	DL T.LT	DL T.RT	G1 + LT	G1 + RT	G1 - LT	G1 - RT
P 1	-33.476	-33.476	-33.476	-33.476	-33.476	-33.476	-33.476	-19.222	-501.418	-19.222	-501.418	-19.222	-852.794
P 2	-5017.802	-5017.802	-8297.197	-5017.802	-5017.802	-5017.802	-6981.513	-571.677	-1027.912	-571.677	-1027.912	-923.053	-1632.275
P 3	-5705.467	-5705.467	-9387.973	-5705.467	-5705.467	-5705.467	-7910.561	-1034.078	-1034.078	-1034.078	-1034.078	-1638.441	-1638.441
C 1L	-9916.662	-9916.662	-16016.619	-9916.662	-9916.662	-9916.662	-13569.331	-1071.518		-1071.518		-1675.881	
C 1R	-9725.588	-9725.588	-15573.104	-9725.588	-9725.588	-9725.588	-13227.094		1112.624		1759.539	1112.624	
P 4	-5349.970	-5349.970	-8609.827	-5349.970	-5349.970	-5349.970	-7301.980	1075.184	1075.184	1722.099	1722.099	1075.184	1075.184
P 5	-4634.887	-4634.887	-7463.252	-4634.887	-4634.887	-4634.887	-6328.519	1069.018	530.649	1715.932	833.699	1069.018	530.649
P 6	-33.476	-33.476	-33.476	-33.476	-33.476	-33.476	-33.476	460.390	19.222	763.440	19.222	460.390	19.222

PT.	M+ UNF. K-FT.		M- UNF. K-FT.		TOP REINFORCE. AS NO.SIZE		BOT.REINFORCE. AS NO.SIZE		CAP DESIGN DATA LEFT STIRRUPS M.SP. AV/IN BAR&SPAC		RIGHT STIRRUPS M.SP. AV/IN BAR&SPAC		D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO
	P 1	-25.751	-25.751	3.12	2 # 11	3.12	2 # 11	0.00	0.000 #5@ 0.00	24.00	0.149 #5@ 4.16	60.77					
P 2	-3859.848	-5370.395	21.05	14 # 11	3.12	2 # 11	24.00	0.060 #5@10.33	24.00	0.212D#5@ 5.84	93.65		0.36	0.656	0.999		
P 3	-4388.821	-6085.047	23.26	15 # 11	3.12	2 # 11	24.00	0.205D#5@ 6.06	24.00	0.205D#5@ 6.06	96.00		0.38	0.685	1.008		
C 1	-7481.222	-10437.947	40.96	27 # 11	3.12	2 # 11	24.00	0.215D#5@ 5.77	24.00	0.233D#5@ 5.33	96.00		0.66	0.672	0.903		
P 4	-4115.362	-5616.908	21.28	14 # 11	3.12	2 # 11	24.00	0.222D#5@ 5.58	24.00	0.222D#5@ 5.58	96.00		0.35	0.649	1.018		
P 5	-3565.298	-4868.092	18.88	13 # 11	3.12	2 # 11	24.00	0.231D#5@ 5.38	24.00	0.060 #5@10.33	93.65		0.32	0.606	0.997		
P 6	-25.750	-25.751	3.12	2 # 11	3.12	2 # 11	24.00	0.119 #5@ 5.23	0.00	0.000 #5@ 0.00	60.77		0.08	0.000	0.098		

NOTE: \*\*\* FS/FZ RATIO EXCEEDS 1.0! \*\*\*

□ COLUMN ANALYSIS AND DESIGN OUTPUT

CN	T B	CRITICAL COLUMN LOADS																		
		GR	LLC	WC	R	E S	C F	S F	PF	MTF	MLF	PM	MTM	MLM	PU	MTU	MLU	PU/PM	B	D
1	T	1	LL06	0.0				C	3082.2	-5099.6	0.0	3082.2	7532.3	3404.4	6491.6	15800.5	7141.2	2.099	72.00	96.00
1	B	2	3.1						3718.4	14376.5	-7335.9	3718.4	19313.6	11289.8	8785.5	45623.0	26669.0	2.362	112.80	136.80

CN	T B	COLUMN DESIGN DATA														
		B FACE 1 NO.SIZE	B FACE 2 NO.SIZE	D FACE 3 NO.SIZE	D FACE 4 NO.SIZE	AS	PS	BD12	BD	SUMPU	SUMPC	DEL.T	DEL.L	CM	R	PHIC
1	T	15 # 11	15 # 11	8 # 11	8 # 11	71.76	1.038	1.00	0.029	3849.	11918.	1.477	1.841	1.000	2	0.70
1	B	26 # 11	26 # 11	24 # 11	24 # 11	156.00	1.011	1.00	0.063	2951.	11545.	1.343	1.539	1.000	2	0.70

□ FOOTING 1 DESIGN LOADS

F G	LLID	WC	ES	C	S	P	MT	VT	ML	VL	P4	P3	P2	P1	MTF	VBF	VPF	LOAD
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PIER-32-4-180-110.OUT														
1 2	3.1			2860.30211058.814	93.701-5643.002	-49.691	122.165	39.333	208.093	290.925	254.628	46.348	34.623	MAX.P1
1 3 LL06	1.1	C		4180.40115081.192	104.628-3342.963	-27.813	146.110	97.181	325.226	374.155	360.004	65.219	50.475	MAX.MT
1 3 LL06	1.1	C		4180.40115081.192	104.628-3342.963	-27.813	146.110	97.181	325.226	374.155	360.004	65.219	50.475	MAX.VT
1 3 LL05	1.1	C		4185.88514746.406	104.628-3342.963	-27.813	148.785	99.856	323.049	371.979	357.521	64.792	50.540	MAX.VP
1 2	3.1			3718.39314376.458	121.811-7335.903	-64.598	158.815	51.133	270.521	378.203	355.625	47.692	45.010	MAX.ML
1 2	3.1			3718.39314376.458	121.811-7335.903	-64.598	158.815	51.133	270.521	378.203	355.625	47.692	45.010	MAX.VL
1 5	1.1	E		2860.30213070.578	110.783-2960.650	-26.915	87.163	43.631	243.095	286.627	272.147	49.358	34.623	MAX.P3

FOOTING 1 ANALYSIS/DESIGN RESULTS

FOOTING SIZE			* BAR REINFORCEMENT STEEL *							SECTION CAPACITIES			
B	D	T	P1/PA	AS	NO.SIZE	SPAC.	PLACEMENT	MT.	VB	VP	DS	FC	
25.500	25.500	6.250	0.990	1.39	28 #10	@10.875	TOP LONG	357.209	70.114	140.227	58.095	0.000	
				1.37	28 #10	@10.875	BOT.TRAN	365.179	71.646	143.293	59.365	0.000	

NUMBER OF PILES = 22 BP = 5.750 DP = 5.750